Apr 30th, 8:30 AM - 11:00 AM

Panel Session III - Future Roles of the Space Shuttle in Support of Human Space Flight

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Future Roles of the Space Shuttle in Support of Human Space Flight

Presented to the 40th Space Congress

Access to Space: L.E.O. & Beyond

By John M. Lounge

Boeing NASA Systems

Update: 10/24/02

NASA Integrated Space Transportation Plan

02 03 04 05 06 07 08 09 10 11 12 13 14 15 16 17 18 19 20 21 22

International Space Station

US Core Complete

IP Core Complete

ISS Extend?

Future Exploration beyond LEO?

Space Shuttle

Competition Decisions

Operate Thru Mid Next Decade

Extend?

Extend Until 2020+

Further Extend as Crew and/or Cargo Vehicle?

Orbital Space Plane

Design

Orbital Tech Demo

FSD Decision

Development

ISS Crew Return Capable

Crew Transfer on Human-Rated EELV

OSP Primary Crew Vehicle?

Operations

Next Generation Launch Technology

Tech

Long-Term Technology Program

Launch System Decision (Based on Reqt, $, DoD)

Risk Reduction

FSD Decision

Development

1st Flight

OSP Bridge To New Launcher

Operations

Hypersonic FSD?

Access to Space: LEO & Beyond

Shuttle Derived Heavy Lift?

2nd Gen Launch Vehicle?

OSP for Crew New Vehicle for Cargo

OSP for Crew Shuttle for Cargo

Columbia Replacement?

Shuttle SLEP

Shuttle Service Life Extension

- **SLEP Objectives:**
  - **“Assure That All Critical Assets Are in Place to Safely and Efficiently Fly the Space Shuttle Through at Least the Middle of the Next Decade”**
- **SLEP Approach:**
  - **Use the Summit Process to Identify Safety, Sustainability, Performance, Operations and Infrastructure Initiatives**
  - **Combine Those Initiatives Into a Comprehensive Strategy and Implementation Plan**

SLEP Process

Operations
Performance
Industry
Infrastructure
Sustainability
Safety

SLEP PANELS

Operations
Performance
Industry
Infrastructure
Sustainability
Safety
1.
2.
3.
4.
5.
6.
7.

Prioritized Project Lists

Operations
Performance
Industry
Infrastructure
Sustainability
Safety
$M
2004
2022

Panel Long Range Investment Plans

Integration Panel
Resources Panel

Integration/Resource Panels

Integrated Project Priority List
1. _____
2. _____
3. _____
4. _____

LRP
$M
2004
2022

Recommended Integrated Long Range Investment Plan

AA-OSF
DAA ISS & SSP
AA S&MA
Center Dirs.

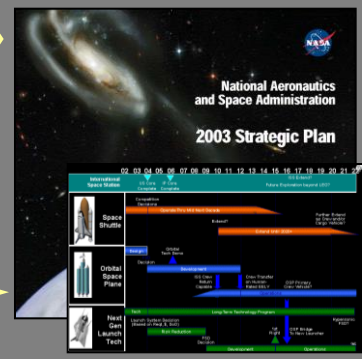
Space Flight Leadership Council

Near Term POP Initiatives

Tiger Team Evaluations

SSP

Agency POP Process

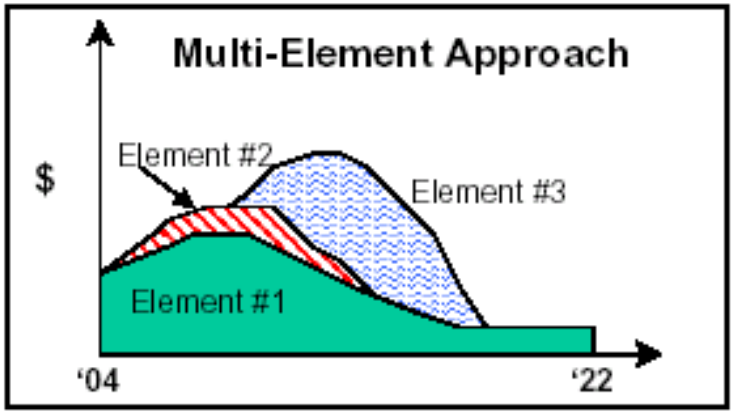


LRP
$M
2004
2022

Approved Long Range Investment Plan

Industry Panel Recommendation: Multi-Element Approach

- **Element #1 – "Safely Support the ISS to 2022"**
  - Must maintain the current capabilities by addressing: investment backlog in infrastructure and obsolescence, workforce issues, revitalization of supplier base, safety improvements. This forms the basis for flying Shuttle to 2022 with increased safety.



- **Element #2 – "Expanded ISS Support"**
  - Improve the Shuttle capability to ISS by investing in performance enhancements to support ISS. Use SSP to continue assured ISS access and phase in of uncrewed orbiter
- **Element #3 – "Expand HSF support and enhance SSP mission model"**
  - Provides investment to define systems improvements beyond those found in Element #2 that lead to a Shuttle-based Heavy Lift Vehicle and expanded mission model.

Still Missing:
Top Level Shuttle Program Requirements

for example:

Goals & Objectives	'04	'10	'16	'22
Fly Safely	• LoV/C 1 in 265	• LoV/C 1 in 400	• LoV/C 1 in 500 •	• LoV/C 1 in 600 •
Meet the Manifest	• 14 kts crosswind restriction, no autoland • TAL Weather restrictions • T+250s Intact ATO no engine out	• 20 kts crosswind restriction,no autoland • TAL Weather restrictions removed • T+0s Intact ATO no engine out	• 20 kts crosswind restriction with autoland • RTLS Weather restrictions removed • T+0s Intact ATO with engine out	• 20 kts crosswind restriction with autoland • RTLS Weather restrictions removed • T+0s Intact ATO with engine out
Improve Supportability	• Service Life = 2015 • Backlog index = X • Infrastructure Invest < 1% of asset value	• Service Life = 2022 • Backlog index = 0 • Infrastructure Invest = 1% of asset value	• Service Life = 2030 • Infrastructure Invest = 2% of asset value	• Service Life = 2030 • Infrastructure Invest = 3% of asset value
Improve the System	• Long duration ISS stays = 16 days • Station upmass = 37K lbs	• Long duration ISS stays = 30 days • Station upmass = 40K lbs	• Long duration ISS stays = 60 days • Station upmass = 45K lbs	• Long duration ISS stays = 90 days • Station upmass = 50K lbs
Support New Programs			• High energy upper stage deployment of 7.5Klbs @ 15,000 fps delta V	• Shuttle-derived HLV with lift capability of 160K lbs

Access to Space: LEO & Beyond

Shuttle Derived Heavy Lift?

2nd Gen Launch Vehicle?

OSP for Crew New Vehicle for Cargo

OSP for Crew Shuttle for Cargo

Columbia Replacement?

Shuttle SLEP

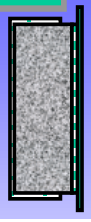
OV106?

- Current Boeing internal R&D effort evaluating schedule and cost to produce a “build to print” replacement using 21st Century manufacturing capabilities

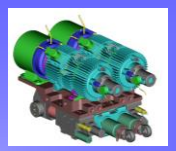
or OV201?

Modern Avionics with IVHM

Advanced Structures & TPS



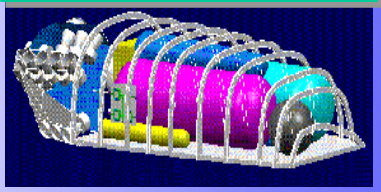
Non-Toxic
Power &
Electric Actuation



Human Access to Space
Though 2025 and Beyond

Mitigate Obsolescence
Improve Safety/Reliability
Reduce Operating Costs
Enhance Mission Flexibility

Non-Toxic OMS/RCS

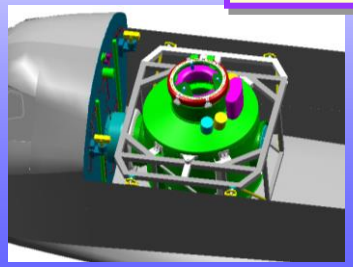


Informed
Maintenance
On Demand

Standardized
Payload
Interfaces

Blk II SSME
Phase 2B AHMS

Crew Escape



Access to Space: LEO & Beyond

Shuttle Derived Heavy Lift?

2nd Gen Launch Vehicle?

OSP for Crew New Vehicle for Cargo

OSP for Crew Shuttle for Cargo

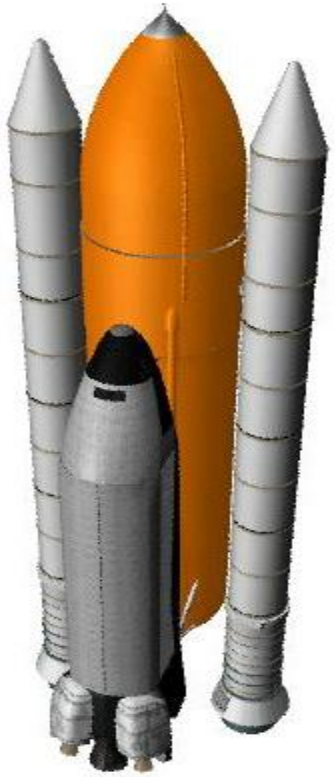
Columbia Replacement?

Shuttle SLEP

Shuttle Derived Cargo Vehicles

Unmanned Orbiter
60K lbs to LEO

Fly Back Second Stage
100K+ lbs to LEO



Expendable Heavy Lift
200K lbs to LEO

Future of Shuttle

- **The Space Shuttle will be a part of the future of Human Space Flight**
- **Robust, requirements driven SLEP is the foundation**
- **Detailed studies of alternate configurations and operations concepts should be started as soon as possible**